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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/027,372	12/19/2001	Seyed-Ali Hajimiri	121744-0003 (CIT 3190-1)	9641
20594	7590	07/28/2004	EXAMINER	
CHRISTOPHER J. ROURK AKIN, GUMP, STRAUSS, HAUER & FELD, L.L.P. P O BOX 688 DALLAS, TX 75313-0688			CHO, UN C	
			ART UNIT	PAPER NUMBER
			2682	
			DATE MAILED: 07/28/2004	

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/027,372

Applicant(s)

HAJIMIRI ET AL.

Examiner

Un C Cho

Art Unit

2682

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 14 is/are rejected.
- 7) ☒ Claim(s) 6-13 and 15 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6,7 and 8</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 5/31/2002, 04/28/2003 and 7/18/2003 were filed after the mailing date of the Application #10/027,372 on 12/19/2001. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

2. Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:
Page 6, line 15 recites "downconverterfurther" it should be "downconverter further" instead.

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Page 17, line 5 recites "quadarature ... mized" it should be "quadrature ... mixed" instead.

Page 17, line 6 recites "improed" it should be "improved" instead.

Page 17, line 19 recites "cascode" it should be "cascade" instead.

Appropriate correction is required.

Claim Objections

4. Claim 8 is objected to because of the following informalities:

Claim 8, lines 3 – 4 and 13 recites "block adapted produce", it should be "adapted to produce" instead.

Claim 15, line 11 recites "IF signal with the a quadrature LO2 signal" it should be "IF signal with the quadrature LO2 signal" instead.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 4 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh (EP 0886384) in view of Liu (US 2003/0181187).

Regarding claim 1, Yeh teaches a dual-band receiver that receives a signal at two desired frequency bands (Yeh, Page 7, lines 38 – 39) comprising a

dual-band front-end subsystem (Yeh, Fig. 11, antenna 12, filter 16 and dual-band LNA 18). However, Yeh rather than teaching the dual-band image-rejection frequency downconverter connected to the front-end subsystem, it teaches an optional image-rejection filter prior to the dual-band image-rejection frequency downconverter (Yeh, Fig. 11, image rejection filter) (Yeh, Page 7, lines 44 – 52). In contrast, Liu teaches a receiver with front-end subsystem (Liu, Fig. 1, 10 antenna, 11 BPF, 12 LNA) and image-rejection frequency downconverter (Liu, Fig. 1, 13, 14) (Liu, Page 1, Paragraph 0011 lines 1 – 6 and Paragraph 0012, lines 1 – 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teachings of Liu to Yeh to provide a solution that enhances the image-rejection performance of digital communication receivers that are implemented with integrated circuit technology.

Regarding claim 4, Yeh as modified by Liu teaches dual-band antenna (Yeh, Fig. 11, 12), dual-band bandpass filter (Yeh, Fig. 11, 16) connected to the antenna, which receives the dual-band signal from the antenna and dual-band LNA (Yeh, Fig. 11, 18) connected to the filter.

Regarding claim 14, the claim is interpreted and rejected for the same reason as set forth in claim 1.

7. Claims 2, 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh in view of Liu as applied to claim 1 above, and further in view of Abdelgany et al. (US 2003/0193923).

Regarding claim 2, Yeh as modified by Liu teaches the front-end subsystem (Yeh, Fig. 11, antenna 12, filter 16 and dual-band LNA 18) outputting an RF signal having signal attenuation regions at frequency bands outside the two desired frequency bands (Yeh, Page 7, lines 42 – 44) and the downconverter including a first image-rejection down conversion state that receives the RF signal from the front end subsystem (Yeh, Page 7, lines 44 – 46) and that is adapted to down convert the RF signal at two desired bands to two intermediate frequency bands (Yeh, Page 7, lines 47 – 49). However, Yeh as modified by Liu fails to teach a subsequent image rejection down conversion stage that down converts the two IF bands. In contrast, Abdelgany teaches a subsequent image rejection down conversion stage that down converts the two IF bands (Abdelgany, Fig. 14, 1630) (Abdelgany, Page 14, Paragraph 0134 lines 1 – 8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the teachings of Abdelgany to Yeh to provide a system and process for a multi-mode, multi-band communication transceiver that shares functional blocks to minimize size, weight, complexity, power consumption and cost.

Regarding claim 3, Yeh as modified by Liu and Abdelgany teaches that the subsequent image rejection down conversion signal down converts the two IF bands to base band (Abdelgany, Fig. 14, 1630) (Abdelgany, Page 14, Paragraph 0134 lines 1 – 8).

Regarding claim 5, the claim is interpreted and rejected for the same reason as set forth in claim 2.

Allowable Subject Matter

8. Claims 6, 7, 8, 9, 10, 11, 12, 13 and 15 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 6, Yeh as modified by Liu and Abdelgany teaches the first down conversion stage (Yeh, Page 7, lines 44 – 52 and Liu, Page 1, Paragraph 0011 lines 1 – 6 and Paragraph 0012, lines 1 – 8). However, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach a second mixer connected to the LO₁ block and the front-end subsystem and adapted to mix the quadrature LO₁ signal with the front-end signal and to supply a resultant quadrature IF signal.

Regarding claim 7, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach further including an in-phase IF filtering and amplification stage connected to the first mixer and a quadrature IF filtering and amplification stage connected to the first mixer and a quadrature IF filtering and amplification stage connected to the second mixer.

Regarding claim 8, Yeh as modified by Liu and Abdelgany teaches a subsequent down conversion stage (Abdelgany, Page 14, Paragraph 0134 lines 1 – 8). However, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach a second quadrature local oscillator block adapted to produce an in-phase signal and a quadrature signal at a second given frequency, a first IF frequency mixing stage connected to the LO₂ block and the first mixer that is adapted to mix the in-phase IF signal with the in-phase signal of the LO₂ block and to supply a resultant first low frequency signal, a second IF mixing stage connected to the LO₂ block and the second mixer that is adapted to mix the quadrature signal of the LO₂ block with the quadrature IF signal and to supply a resultant second LF signal, a third quadrature local oscillator block adapted to produce an in-phase signal and a quadrature signal at a third given frequency, a third IF mixing stage connected to the LO₃ block and the first mixer that is adapted to mix the in-phase LO₃ signal with the in-phase IF signal and to supply a resultant third LF signal and a fourth IF mixing stage connected to the LO₃ block and the second mixer that is adapted to mix the quadrature LO₃ signal with the quadrature IF signal and to supply a resultant fourth LF signal.

Regarding claim 9, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach a first summing circuit that combines the first and second LF signals and a second summing circuit that combines the third and fourth LF signals.

Regarding claim 10, Yeah as modified by Liu and Abdelgany teaches the first IF mixing stage including a first IF mixer (Yeh, Page 7, lines 44 – 52 and Liu, Page 1, Paragraph 0011 lines 1 – 6 and Paragraph 0012, lines 1 – 8) and the second IF mixing stage including a second IF mixer (Abdelgany, Page 14, Paragraph 0134 lines 1 – 8). However, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach the third IF mixing stage including a third IF mixer the fourth IF mixing stage including a fourth IF mixer.

Regarding claim 11, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach the first IF mixing stage includes a first IF mixer that mixes the in-phase IF signal with in-phase LO_2 signal and a fifth IF mixer that mixes the in-phase IF signal with quadrature LO_2 signal, the second IF mixing stage includes a second mixer that mixes the quadrature IF signal with the quadrature LO_2 signal and a sixth IF mixer that mixes the quadrature IF signal with the in-phase LO_2 signal, the third IF mixing stage includes a third mixer that mixes the in-phase IF signal with the in-phase LO_3 signal and a seventh mixer that mixes the in-phase IF signal with the quadrature LO_3 signal and the fourth IF mixing stage includes a fourth mixer that mixes the quadrature IF signal with the quadrature LO_3 signal and an eighth mixer that mixes the quadrature IF signal with the in-phase LO_3 signal.

Regarding claim 12, Yeh as modified by Liu and Abdelgany fails to teach a first summing circuit that sums the outputs of the first and second mixers, a second summer that sums the outputs of the fifth and sixth mixers, a third

summing circuit that sums the outputs of the third and fourth mixers and a fourth summing circuit that sums the outputs of the seventh and eighth mixers.

Regarding claim 13, Yeh as modified by Liu and Abdelgany teaches the first down conversion stage including a front-end signal phase shifter connected to the front-end subsystem that provides a quadrature front-end signal along a quadrature front-end signal path, a first local oscillator block adapted to supply an in-phase signal of a first predetermined frequency, a first mixer connected to the LO₁ block and the front-end subsystem that is adapted to mix the LO₁ signal with the front-end signal and to supply a resultant in-phase intermediate frequency signal (Yeh, Page 7, lines 44 – 52, Liu, Page 1, Paragraph 0011 lines 1 – 6 and Paragraph 0012, lines 1 – 8 and Abdelgany, Page 14, Paragraph 0134 lines 1 – 8). However, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach a second mixer connected to the LO₁ block and the front-end phase-shifter and adapted to mix the LO₁ signal with the quadrature front-end signal and to supply a resultant quadrature IF signal, wherein the first predetermined frequency of the LO₁ block is offset from the midpoint of the two desired bands such that the image frequency bands of the two desired bands fall at attenuation regions of the front-end transfer function.

Regarding claim 15, Yeh as modified by Liu and Abdelgany teaches the down converting step including splitting the RF signal to first and second signal processing paths, mixing the RF signal on the first path with an in-phase first local oscillator signal to produce an in-phase intermediate frequency signal (Yeh,

Page 7, lines 44 – 52, Liu, Page 1, Paragraph 0011 lines 1 – 6 and Paragraph 0012, lines 1 – 8). However, Yeh as modified by Liu and Abdelgany either alone or combination fails to teach filtering the quadrature IF signal. Mixing the filtered in-phase IF signal with an in-phase second local oscillator signal, mixing the filtered quadrature IF signal with the quadrature LO₂ signal, mixing the filtered in-phase IF signal with an in-phase LO₃ signal, mixing the filtered quadrature IF signal with the quadrature LO₃ signal, adding the mixed in-phase LO₂ signal to the quadrature LO₂ signal and subtracting the mixed in-phase LO₃ signal from the mixed quadrature LO₃ signal.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Un C Cho whose telephone number is (703)305-8725. The examiner can normally be reached on M ~ F 8:00AM to 4:30PM.

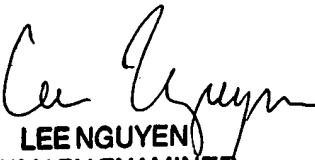
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on (703)308-6739. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Un C Cho
Art Unit 2682
Examiner

UC 7/19/04


LEE NGUYEN
PRIMARY EXAMINER